WHAT IS CLAIMED IS:

1. A chromatic dispersion compensation module comprising,

an enclosure (49) including an input terminal (41) and an output terminal (42),

a higher-order mode chromatic dispersion compensation optical line (40) situated inside the enclosure and disposed between the input terminal and the output terminal, the line comprising one or more HOM multimode chromatic dispersion compensation optical fibers (43, 45) in series and not comprising any single-mode optical fiber,

an input mode converter (46) for converting the fundamental mode into said higher order mode, situated between the input terminal and the compensation optical line,

an output mode converter (47) for converting said higher order mode into the fundamental mode, situated between the compensation optical line and the output terminal,

the module being adapted to be inserted by means of the input and output terminals into a transmission line comprising a standard single-mode line optical fiber adapted to transmit information in a spectral domain of use,

the input terminal and the input mode converter together introducing into the transmission line an input loss $\Gamma_{in}$ expressed in dB,

the output terminal and the output mode converter together introducing into the transmission line an output loss $\Gamma_{out}$ expressed in dB,

additional connections, if any, between compensation optical fibers together introducing into the transmission line a connection loss $\Gamma_{inter}$ expressed in dB,

the compensation optical fiber or the set of compensation optical fibers in series presenting, at a

wavelength of 1550 nm, a plurality of average parameters including an average coefficient of attenuation $\alpha_{DCF}$ expressed in dB/km, an average chromatic dispersion $D_{DCF}$ expressed in ps/nm-km and that is negative, an average dispersion slope $S_{DCF}$ expressed in ps/nm$^2$-km and that is negative, an average chromatic dispersion to dispersion slope ratio $D_{DCF}/S_{DCF}$ expressed in nm, an average figure of merit $FOM_{DCF}$ defined as $-D_{DCF}/\alpha_{DCF}$ expressed in ps/nm-dB, an average effective area $A_{eff}$ expressed in $\mu m^2$, and an average second order coefficient $n_2$ of the refractive index as a function of the intensity expressed in $10^{-20} m^2/W$,

the average chromatic dispersion to dispersion slope ratio being the ratio between the average chromatic dispersion and the average dispersion slope,

the average figure of merit being the negative of the ratio between the average chromatic dispersion and the average coefficient of attenuation,

the average coefficient of attenuation in the case of a single compensation optical fiber being lumped with the corresponding coefficient of attenuation of said single compensation optical fiber and in the case of a set of compensation optical fibers in series, the average coefficient of attenuation is equal to the sum of the corresponding attenuation coefficients of the various compensation optical fibers weighted by their respective contributions to the total series length of the compensation optical fibers plus the ratio of the connection loss divided by said total length,

each of said other average parameters in the case of a single compensation optical fiber being lumped with the corresponding parameter of said single compensation optical fiber and each of said other average parameters in the case of a set of compensation optical fibers in series being the arithmetic mean of the corresponding

parameters of the various compensation optical fibers when weighted by the respective lengths of said various compensation optical fibers,

the module having insertion losses IL expressed in dB,

where $IL = \frac{D_{DCM}}{D_{DCF}} \cdot \alpha_{DCF} + \Gamma_{in} + \Gamma_{out}$

and where $D_{DCM}$ = -1360 ps/nm,

the module having a non-linearity criterion NLC representing the effects of the non-linear phase and expressed in $10^{-6}$km/W-dB,

where $NLC = \dfrac{100 \cdot n_2 \cdot (1 - 10^{\frac{D_{DCM}}{10 \cdot FOM_{DCF}}})}{A_{eff} \cdot \alpha_{DCF} \cdot 10^{\frac{\Gamma_{in}}{10}}}$,

the module presenting a quality criterion CQ expressed in dB,

where $\mathrm{CQ} = \mathrm{IL} + 10 \log \mathrm{NLC}$,

and the compensation optical fiber or the set of compensation optical fibers in series having,

firstly, an average chromatic dispersion more negative than -200 ps/nm-km,

secondly, an average chromatic dispersion to dispersion slope ratio in the range 240 nm to 400 nm, and

thirdly, an average chromatic dispersion sufficiently negative for the quality criterion to be less than 9.5 dB.

2. A module according to claim 1, characterized in that the compensation optical fiber or the set of compensation optical fibers in series has average chromatic dispersion sufficiently negative for the quality criterion to be less than 9 dB.

3. A module according to claim 1, characterized in that the compensation optical fiber or the set of compensation

optical fibers in series has average chromatic dispersion sufficiently negative for the quality criterion to be less than 8.5 dB.

4. A module according to claim 1, characterized in that the insertion losses are less than 5 dB.

5. A module according to claim 5, characterized in that at least one of the compensation optical fibers of the compensation optical line has a core with at least four core segments, to which core cladding is added.

6. A module according to claim 1, characterized in that at least one of the compensation optical fibers of the compensation optical line has a core with at least five core segments, to which core cladding is added.

7. A module according to either claim 1 or claim 5, characterized in that the compensation optical fiber or the set of compensation optical fibers in series has an average chromatic dispersion to dispersion slope ratio in the range 270 nm to 370 nm.

8. A chromatic dispersion compensation module comprising,

an enclosure (49) including an input terminal (41) and an output terminal (42),

a higher-order mode chromatic dispersion compensation optical line (40) situated inside the enclosure and disposed between the input terminal and the output terminal, the line comprising one or more HOM multimode chromatic dispersion compensation optical fibers (43, 45) in series and not comprising any single-mode optical fiber,

an input mode converter (46) for converting the fundamental mode into said higher order mode, situated

between the input terminal and the compensation optical line,

an output mode converter (47) for converting said higher order mode into the fundamental mode, situated between the compensation optical line and the output terminal,

the module being adapted to be inserted by means of the input and output terminals into a transmission line comprising a standard single-mode line optical fiber adapted to transmit information in a spectral domain of use,

and the compensation optical fiber or at least one of the compensation optical fibers in series having a core having at least five core segments, to which core cladding is added, so that said optical fiber having a core with at least five core segments simultaneously has, at a wavelength of 1550nm, chromatic dispersion more negative than -300 ps/nm-km and a chromatic dispersion to dispersion slope ratio greater than 200 nm.

9. A chromatic dispersion compensation module comprising,

an enclosure (49) including an input terminal (41) and an output terminal (42),

a higher-order mode chromatic dispersion compensation optical line (40) situated inside the enclosure and disposed between the input terminal and the output terminal, the line comprising one or more HOM multimode chromatic dispersion compensation optical fibers (43, 45) in series and not comprising any single-mode optical fiber,

an input mode converter (46) for converting the fundamental mode into said higher order mode, situated between the input terminal and the compensation optical line,

an output mode converter (47) for converting said higher order mode into the fundamental mode, situated between the compensation optical line and the output terminal,

the module being adapted to be inserted by means of the input and output terminals into a transmission line comprising a single-mode non-zero (at 1550 nm) dispersion shifted line optical fiber adapted to transmit information in a spectral domain of use,

the input terminal and the input mode converter together introducing into the transmission line an input loss $\Gamma_{in}$ expressed in dB,

the output terminal and the output mode converter together introducing into the transmission line an output loss $\Gamma_{out}$ expressed in dB,

additional connections, if any, between compensation optical fibers together introducing into the transmission line a connection loss $\Gamma_{inter}$ expressed in dB,

the compensation optical fiber or the set of compensation optical fibers in series presenting, at a wavelength of 1550 nm, a plurality of average parameters including an average coefficient of attenuation $\alpha_{DCF}$ expressed in dB/km, an average chromatic dispersion $D_{DCF}$ expressed in ps/nm-km and that is negative, an average dispersion slope $S_{DCF}$ expressed in ps/nm$^2$-km and that is negative, an average chromatic dispersion to dispersion slope ratio $D_{DCF}/S_{DCF}$ expressed in nm, an average figure of merit $FOM_{DCF}$ defined as $-D_{DCF}/\alpha_{DCF}$ expressed in ps/nm-dB, an average effective area $A_{eff}$ expressed in $\mu m^2$, and an average second order coefficient $n_2$ of the refractive index as a function of the intensity expressed in $10^{-20} m^2/W$,

the average chromatic dispersion to dispersion slope ratio being the ratio between the average chromatic dispersion and the average dispersion slope,

the average figure of merit being the negative of the ratio between the average chromatic dispersion and the average coefficient of attenuation,

the average coefficient of attenuation in the case of a single compensation optical fiber being lumped with the corresponding coefficient of attenuation of said single compensation optical fiber and in the case of a set of compensation optical fibers in series, the average coefficient of attenuation is equal to the sum of the corresponding attenuation coefficients of the various compensation optical fibers weighted by their respective contributions to the total series length of the compensation optical fibers plus the ratio of the connection loss divided by said total length,

each of said other average parameters in the case of a single compensation optical fiber being lumped with the corresponding parameter of said single compensation optical fiber and each of said other average parameters in the case of a set of compensation optical fibers in series being the arithmetic mean of the corresponding parameters of the various compensation optical fibers when weighted by the respective lengths of said various compensation optical fibers,

the module having insertion losses IL expressed in dB,

where $IL = \frac{D_{DCM}}{D_{DCF}} \cdot \alpha_{DCF} + \Gamma_{in} + \Gamma_{out}$

and where $D_{DCM}$ = -680 ps/nm,

the module having a non-linearity criterion NLC representing the effects of the non-linear phase and expressed in $10^{-6}$km/W-dB,

where $NLC = \frac{100 \cdot n_2 \cdot (1 - 10^{\frac{D_{DCM}}{10 \cdot FOM_{DCF}}})}{A_{eff} \cdot \alpha_{DCF} \cdot 10^{\frac{\Gamma_{in}}{10}}}$,

the module having a quality criterion CQ expressed in dB,

where $CQ = IL + 10\log NLC$,

and the compensation optical fiber or the set of compensation optical fibers in series presenting,

firstly, an average chromatic dispersion more negative than -250 ps/nm-km,

secondly, an average chromatic dispersion sufficiently negative for the quality criterion to be less than 5 dB.

10. A module according to claim 9, characterized in that the compensation optical fiber or the set of compensation optical fibers in series has average chromatic dispersion sufficiently negative for the quality criterion to be less than 5 dB.

11. A module according to claim 10, characterized in that the compensation optical fiber or the set of compensation optical fibers in series has average chromatic dispersion sufficiently negative for the quality criterion to be less than 4.5 dB.

12. A module according to claim 11, characterized in that the insertion losses are less than 4 dB.

13. A module according to claim 9, characterized in that at least one of the compensation optical fibers of the compensation optical line has a core with at least four core segments, to which core cladding is added.

14. A module according to claim 13, characterized in that at least one of the compensation optical fibers of the compensation optical line has a core with at least five core segments, to which core cladding is added.

15. A module according to either claim 9 or claim 13, characterized in that the compensation optical fiber or the set of compensation optical fibers in series has an average chromatic dispersion to dispersion slope ratio less than 200 nm.

16. A chromatic dispersion compensation module comprising,

an enclosure (49) including an input terminal (41) and an output terminal (42),

a higher-order mode chromatic dispersion compensation optical line (40) situated inside the enclosure and disposed between the input terminal and the output terminal, the line comprising one or more HOM multimode chromatic dispersion compensation optical fibers (43, 45) in series and not comprising any single-mode optical fiber,

an input mode converter (46) for converting the fundamental mode into said higher order mode, situated between the input terminal and the compensation optical line,

an output mode converter (47) for converting said higher order mode into the fundamental mode, situated between the compensation optical line and the output terminal,

the module being adapted to be inserted by means of the input and output terminals into a transmission line comprising a single-mode non-zero (at 1550 nm) dispersion shifted line optical fiber adapted to transmit information in a spectral domain of use,

and the compensation optical fiber or at least one of the compensation optical fibers in series having a core having at least four core segments, to which core cladding is added, so that said optical fiber having a

core with at least four core segments simultaneously has, at a wavelength of 1550nm, chromatic dispersion more negative than -300 ps/nm-km and a chromatic dispersion to dispersion slope ratio greater than 80 nm.

17. A module according to claim 1 or claim 8 or claim 9, characterized in that the compensation optical line consists of a single optical fiber connecting the input mode converter to the output mode converter.

18. A module according to claim 1 or claim 8 or claim 9, characterized in that the compensation optical line comprises a plurality of optical fibers of the same family, that is to say either a plurality of segments of the same optical fiber or a plurality of optical fibers that are similar within their fabrication tolerances.

19. A module according to claim 1 or claim 8 or claim 9 or claim 16, characterized in that the compensation optical line comprises a plurality of separate optical fibers and in that the spectral domain of use comprises at least two of spectral bands S, C and L.

20. A signal amplification and chromatic dispersion compensation system comprising in succession a first signal amplifier (2), a signal attenuator (3), a chromatic dispersion compensation module (4) according to claim 1, and a second signal amplifier (5).

21. A signal amplification and chromatic dispersion compensation system comprising a single signal amplifier (2) followed by a chromatic dispersion compensation module (4) according to claim 1.

22. A transmission line comprising in succession a single-mode line optical fiber (1) adapted to transmit information in a spectral domain of use and a signal amplification and chromatic dispersion compensation system (6) according to claim 20 or claim 21.

23. A method of designing a chromatic dispersion compensation module,

said module being adapted to comprise,

an enclosure including an input terminal and an output terminal,

a higher-order mode chromatic dispersion compensation optical line situated inside the enclosure and disposed between the input terminal and the output terminal, the line comprising one or more HOM multimode chromatic dispersion compensation optical fibers in series and not comprising any single-mode optical fiber,

an input mode converter for converting the fundamental mode into said higher order mode, situated between the input terminal and the compensation optical line,

an output mode converter for converting said higher order mode into the fundamental mode, situated between the compensation optical line and the output terminal,

said module being adapted to be inserted by means of the input and output terminals into a transmission line comprising a single-mode line optical fiber adapted to transmit information in a spectral domain of use,

the input terminal and the input mode converter together introducing into the transmission line an input loss $\Gamma_{in}$ expressed in dB,

the output terminal and the output mode converter together introducing into the transmission line an output loss $\Gamma_{out}$ expressed in dB,

additional connections, if any, between compensation optical fibers together introducing into the transmission line a connection loss $\Gamma_{inter}$ expressed in dB,

the compensation optical fiber or the set of compensation optical fibers in series presenting, at a wavelength of 1550 nm, a plurality of average parameters including an average coefficient of attenuation $\alpha_{DCF}$ expressed in dB/km, an average chromatic dispersion $D_{DCF}$ expressed in ps/nm-km and that is negative, an average dispersion slope $S_{DCF}$ expressed in ps/nm$^2$-km and that is negative, an average chromatic dispersion to dispersion slope ratio $D_{DCF}/S_{DCF}$ expressed in nm, an average figure of merit $FOM_{DCF}$ defined as $-D_{DCF}/\alpha_{DCF}$ expressed in ps/nm-dB, an average effective area $A_{eff}$ expressed in $\mu m^2$, and an average second order coefficient $n_2$ of the refractive index as a function of the intensity expressed in $10^{-20}m^2/W$,

the average chromatic dispersion to dispersion slope ratio being the ratio between the average chromatic dispersion and the average dispersion slope,

the average figure of merit being the negative of the ratio between the average chromatic dispersion and the average coefficient of attenuation,

the average coefficient of attenuation in the case of a single compensation optical fiber being lumped with the corresponding coefficient of attenuation of said single compensation optical fiber and in the case of a set of compensation optical fibers in series, the average coefficient of attenuation is equal to the sum of the corresponding attenuation coefficients of the various compensation optical fibers weighted by their respective contributions to the total series length of the compensation optical fibers plus the ratio of the connection loss divided by said total length,

each of said other average parameters in the case of a single compensation optical fiber being lumped with the corresponding parameter of said single compensation optical fiber and each of said other average parameters in the case of a set of compensation optical fibers in series being the arithmetic mean of the corresponding parameters of the various compensation optical fibers when weighted by the respective lengths of said various compensation optical fibers,

said module being adapted to present insertion losses IL expressed in dB,

where $IL = \frac{D_{DCM}}{D_{DCF}} \cdot \alpha_{DCF} + \Gamma_{in} + \Gamma_{out}$

and where $D_{DCM}$ represents the negative of the cumulative dispersion of the line optical fiber, said module being adapted to have a non-linearity criterion NLC representing the effects of the non-linear phase and expressed in $10^{-6}$km/W-dB,

where $NLC = \frac{100 \cdot n_2 \cdot (1 - 10^{\frac{D_{DCM}}{10 \cdot FOM_{DCF}}})}{A_{eff} \cdot \alpha_{DCF} \cdot 10^{\frac{\Gamma_{in}}{10}}}$,

said module being adapted to present a quality criterion CQ expressed in dB,

where $\mathrm{CQ} = \mathrm{IL} + 10 \log \mathrm{NLC}$,

said design method including an optimization step for optimizing said module, said optimization step consisting in reducing the quality criterion.

24. A higher-order mode chromatic dispersion compensation optical fiber having a core having at least four core segments, to which core cladding is added, and simultaneously having, at a wavelength of 1550nm, chromatic dispersion more negative than -300 ps/nm-km and a chromatic dispersion to dispersion slope ratio greater than 80 nm.

25. A higher-order mode chromatic dispersion compensation optical fiber according to claim 24, wherein said higher-order mode is $LP_{02}$.

26. A higher-order mode chromatic dispersion compensation optical fiber according to claim 24 or 25, wherein said chromatic dispersion to dispersion slope ratio is greater than 120 nm.

27. A higher-order mode chromatic dispersion compensation optical fiber having a core having at least five core segments, to which core cladding is added, and simultaneously having, at a wavelength of 1550nm, chromatic dispersion more negative than -300 ps/nm-km and a chromatic dispersion to dispersion slope ratio greater than 200 nm.

28. A higher-order mode chromatic dispersion compensation optical fiber according to claim 27, wherein said higher-order mode is $LP_{02}$.